System Inspector Manual
CHAPTER 5 - INSPECTION PROCEDURE

Now is the time to put all the knowledge and expertise you have gained so far into practice. This section describes proper inspection procedures, provides some helpful hints and expands upon the inspection guidance and inspection form that is provided in Appendix C of this manual.

From the outset, it is important to remember that a System Inspector is essentially an information gatherer. Inspectors record the condition of the sewage disposal system <u>at the time</u> they are performing the inspection. Inspectors are not expected to offer warranties as to the future performance of the system. Their job, based on the results of the inspection, is to determine whether the system passes, conditionally passes, requires further evaluation or fails based on the specific criteria in Title 5 and outlined on the inspection form. Once the inspection is complete and the inspection form has been submitted to the approving authority, the inspector has met the responsibilities assigned to him or her by Title 5. If conditions exist which show the system is failing to protect public health, safety or the environment then the approving authority will require that the system be repaired, replaced, or upgraded. **The System Inspector has no enforcement authority and cannot require the system owner to perform upgrades or repairs.**

The inspection must not result in disruption of the functioning of the system and should be conducted to minimize disruption of the site in general. However, at a minimum, all manholes, covers, and cleanouts must be exposed in order to achieve the goal of this inspection. Pumping of system components, when required, shall be done after an initial inspection of the entire disposal system to observe normal operating conditions. Each component requiring pumping can then be re-inspected after pumping has been completed.

Minimum requirements

The following are the minimum requirements necessary to complete an inspection. Meeting these minimum criteria, however, <u>should not</u> be construed as completion of an acceptable inspection if, through reasonable effort, a complete inspection of all components of the system is feasible. Furthermore, if a complete inspection cannot be performed, the inspector must provide adequate documentation of the specific conditions that prevented a complete inspection.

1. The inspector must note the general conditions of the property to identify any obvious signs of failure. These would include backup of sewage to the facility, effluent ponding, breakout to the surface of the ground or to surface waters, and other indications of failure as they are listed in the failure criteria in Title 5.

2. All components prior to the leaching facility must be located and inspected. In a conventional component system, this would generally require inspection of the septic tank and distribution box. If a cesspool system, the single cesspool or, if an overflow cesspool system, all cesspools prior to the final leaching system must be

exposed for inspection.

3. Determine high groundwater elevation at the site through non-intrusive means unless the system owner grants permission to initiate more extensive investigation.

Ideally, an inspection will be performed on a system that is receiving normal flow. Thus, the inspection gives a representative view of the system under normal operating conditions. However, if the system is serving a facility that is unoccupied or the system is dry or not receiving normal flow, then the inspection becomes more problematic. Once again, the inspectors must keep in mind that their job is to record conditions at the time of inspection and not to predict future performance. Accordingly, under these circumstances, there may be certain information that is impossible to obtain, such as depth of sludge and scum layers if inspecting a dry septic tank or determining static water levels in the distribution box if there is no standing water.

A more complicated example involves the inspection of a dry cesspool that has not received flow for an extended period. Sometimes staining along the walls of the cesspool will indicate that at some point during the active life of the cesspool the liquid level was high enough to have violated the failure criteria. While this should be noted on the report, it cannot constitute grounds for failure since it was not directly observed. Essentially, the same rationale should be followed for all other failure criteria: if failure conditions are not observed directly, then the system cannot fail. The only exception to this general rule relates to the separation of groundwater and the bottom of the soil absorption system. The regulations are specific that the historical high groundwater level, obtained by acceptable methods (but not necessarily by direct observation), be used for determining if the system violates the requirement that the bottom of the soil absorption system be above high groundwater.

Preliminary activities

Inspections of onsite systems should begin with a records search at the local board of health or other appropriate sources to obtain design plans and as-built drawings, if available. This information will facilitate locating the system components in the field. If these records are not available, then the components will have to be located by other means. Non-invasive techniques for locating system components are preferred options. However, as a last resort, it may be necessary to expose piping at intervals in order to trace out the layout of the system.

It is also necessary to obtain information on system pumping records. These may be obtained from the owner, operator or board of health; however, official records from the board of health are preferable if for no other reason than to protect the inspector from any liability claims in the event that system owner records are incomplete. The inspector should determine if the system has required pumping more than four times in the past year to determine if that failure criterion has been triggered. Also, the System Inspector should insure that the system or any component thereof has not been pumped within two weeks prior to the inspection. If pumping has occurred within that period, the system will not have had enough time to equilibrate. Thus, circumstances at the time of inspection may not accurately reflect the condition of the system under normal operation.

If there is any indication that the system may need to be pumped during the course of the inspection, it is *extremely* important that the system be evaluated initially before any pumping is done. This will give the System Inspector the opportunity to examine the system in its existing condition that, in turn, will provide valuable information on its condition and function that would otherwise be lost.

Inspection Procedure

<u>General:</u>

The System Inspector should be equipped with a basic toolkit comprised of the following:

Rubber Gloves
Rubber Boots
Masking Tape
100 foot Cloth Measuring Tape
25 foot Steel Measuring Tape
Shovel
Crowbar
Line Level
Sludge Measuring Device
Scum Measuring Device
Flashlight
Mirror
First Aid Kit
Plumber's Snake
Metal Detector

These items will be valuable in carrying out the inspection and protecting the inspector from some of the health hazards likely to be encountered at the job site.

The inspection should begin with an observation of the entire site to note general conditions and check for obvious signs of failure such as surface breakout or ponding. Look for signs of sewage, stains on the ground or saturated, spongy soils. The presence of sewage odors should be determined when first arriving at the site so as not to rely on desensitized olfactory senses later on during the inspection.

The inspector should always try to observe the interior of the facility. This allows the inspector to check such things as the interior sewer piping for defects, cracks, leaks or evidence of blockage, to verify the presence of garbage grinders, to see where the plumbing exits the building and gather other pertinent information. Laundry connections are important items to check to see if they are connected to the main system or if they are on a separate system. Often the only way to determine this is to trace the piping in the building. Walking through the building is also helpful in obtaining accurate flow estimates based on applicable criteria (e.g., number of bedrooms as defined in Title 5, retail floor space, etc.) If available, water meter records should be provided to determine actual flows. It is important to remember that many water meters read in cubic feet of water, so it will be necessary to convert to gallons per day from that data. In addition, the inspector should note the number of current occupants.

While inside the building, the inspector should also flush the toilet or run a small volume of water to see how well the plumbing drains. Slow draining may indicate problems with the system; however, the inspector should not introduce large volumes of water as part of the inspection as this generally does not reflect normal flow. It may be appropriate to run a faucet for 10 or 15 minutes in order to monitor water levels and response times in the septic tank and distribution box, but running water for longer periods of time is not good practice.

The System Inspector should interview occupants concerning back-up or break-out of sewage or evidence of high groundwater on the site.

Components of the system should be located next. Non-invasive search techniques to be employed if as-built plans are not available could include metal detectors to locate steel reinforced tanks or metal pipes. Another method is to insert a plumber's snake at the building sewer to estimate pipe length and to note the direction from which the pipe exits the building. The use of a metal detector may aid in locating the metal snake thereby tracing the pipe location. Other methods such as video cameras or radio/electronic tracking devices may be useful. However, the regulations do require that the septic tank and distribution box be inspected. Accordingly, these components must be located and if non-invasive techniques do not work, then these components must be located by other means. Thus, it may be necessary to expose distribution piping at intervals until the components in question are found. If this is not sufficient, then the search should progress to more extensive excavation until the septic tank and/or distribution box are found.

Septic tank:

Inspecting the septic tank must accomplish specific goals:

1. To insure that it is watertight
2. To determine that it is made of suitable materials
3. To determine that the inlet and outlet tees are intact
4. To determine that sludge and scum depths are not excessive.

The inspector, in accordance with the regulations, must expose and remove the septic tank covers. If they are more than a foot deep, recommend that extensions be provided to at least that elevation, or within six inches of final grade if possible.

Once the covers are off, the inlet and outlet tees should be inspected for damage. If damage is evident, then they should be replaced. Some tanks may have concrete cross-sectional flow baffles in lieu of PVC or concrete tees. These are not allowable substitutes for tees under 15.227(1) and were not allowable under the 1978 code. If they are present, the

System Inspector should note this on the report and recommend that conforming tees be installed. In addition, the inspector should measure the depths of the inlet and outlet tees below the flow line. Many methods can be employed, but the most useful is to use a stick with a white rag wrapped at the bottom of the stick, set the bottom of the stick level with the bottom of the tee and then measure from the mark on the rag showing the flow line to the bottom of the stick. This is the depth of the tee below the flow line. Another method requires a stick with a hinged "flapper" on the bottom. Insert the stick down through the tee and let the flapper fall open. Pull it snug against the bottom of the tee and mark the stick at a reference point at the top of the tank. Next, set the stick even with the flow line and mark at the same reference point. The distance between the two marks is the depth of the tee below the flow line. It is a good idea to use masking tape on the side of the sticks for marking the distances for each individual inspection. In that way, the masking tape can be removed after the inspection that allows the stick itself to remain "clean" and unmarked for the next inspection.

As the septic tank is now semi-exposed, the inspector should determine material of construction. Reasonable attempts should also be made to measure tank dimensions (length, width and depth). If the dimensions cannot be measured, then they should be estimated as accurately as possible. From these measurements, an approximation of the tank volume can be made.

Check liquid levels for evidence of leakage. If the tank is discharging when there is no flow from the facility there may be infiltration to the tank indicating that it may be in high groundwater. If the liquid level is below the outlet invert then the tank is probably leaking to surrounding soils. Leaking tanks must be pumped and inspected further. When the tank is empty, one thing the inspector should look for is whether the weephole in the bottom of the tank has been plugged. If it has not, then this could be a possible cause of leakage. Other causes may be improperly sealed tank halves, cracks or faulty grout at pipe junctions. Watertight septic tanks are essential to the proper function of the system so it is important to recommend repair or replacement of all leaking tanks.

Measure scum depth and thickness and report. The regulations require that the system owner pump the tank if the bottom of the scum layer is within two inches of the bottom of the outlet tee or if the top of the scum layer is within two inches of the top of the outlet tee; if these conditions exist, during the inspection is probably a good time to pump. Otherwise, it must be noted on the inspection form that conditions exist which trigger the regulatory requirement for pumping. The use of the hinged stick is appropriate here also. Lower the stick gently through the scum layer. When the flapper opens, pull it up slowly until you feel resistance against the scum layer. Mark the stick at the reference point used previously. Measure the distance between this mark and the bottom of the outlet tee as determined before. This is the distance between the bottom of the scum layer and the bottom of the tee. The distance between the top of the scum layer and the top of the tee can be measured directly.

Measure sludge depth and thickness with a stick wrapped at the bottom with a white rag. Mark the stick at the reference point. With this reference mark lined up with the mark on the hinged stick, measure the distance from the top of the sludge layer to the bottom of the outlet tee. Require pumping as part of the inspection if indicated by being within 12" of the outlet tee or baffle. Also, the use of a "sludge judge" may be appropriate.

Check for evidence of backup (i.e. liquid level significantly higher than invert of outlet pipe). If such backup is evident, the outlet pipe will need to be examined as it enters the distribution box to determine the cause of backup. Recommend clean out or repair of outlet pipe as necessary or, alternatively, determine if the system may be in failure due to high groundwater.

Distribution box:

The distribution box should be exposed and its cover removed. The first order of business is to determine the static water level in the distribution box. If it is higher than the outlet invert(s), this may be an indication of backup or clogging in the soil absorption system. The inspector should also note if there are solids carrying over into the distribution box. This may be an indication of septic tank malfunction.

The System Inspector must also evaluate the function of the distribution box by determining if it is level and if flow is equal. This can be accomplished by adding water to the box and observing the distribution of liquid to the outlet pipes. If the liquid appears to be distributed in equal portions, then the distribution box is functioning properly. Levelness of the box can be determined using an ordinary carpenter's level laid crosswise at opposite corners. It must be kept in mind that equal distribution of flow is most important and takes precedence over whether the distribution box is absolutely level. If the inspector finds that the distribution box is not allowing equal flow, then corrective measures should be recommended. These may include the installation of plastic weirs on the outlet pipes to adjust flow (commonly known as "speed levellers") or resetting the box itself.

If the distribution system is a pump system, refer to the section on Pump inspection. In either case, the inspector should look for appropriate indications of groundwater elevation as described in the section on Groundwater determination

Soil absorption system:

The soil absorption system is the critical component where the majority of treatment takes place and, at a minimum, must be located by non-intrusive means. Excavation of the entire soil absorption system is not required in the regulations as part of the inspection. However, it may be appropriate to expose a portion of the soil absorption system to determine its condition if other indications of failure (e.g., evidence of breakout, ponding, sewage backup, condition of the distribution box, etc.) suggest that the soil absorption system is not functioning properly or that failure of the soil absorption system is likely.

The soil absorption system should be located by means of record plans, as-built drawings or other documentation. If this is not possible, approximate the location and lay out by examining topography, noting the drain arrangement from the outlet of the distribution box or any other means available.

Once the location of the soil absorption system is established, note the area for obvious signs of failure. If the inspection of other components indicates that the soil absorption system is stressed, then the inspector may wish to encourage the system owner or operator to authorize more extensive investigation, particularly if the soil absorption system is close to the surface and can be examined with soil cores taken by hand augers or opening inspection holes hand dug with a shovel or a post hole digger. The inspector would then be able to determine the condition of the surrounding soil and check for clogging, hydrogen sulfide crust, excessive ponding, or other indications of failure. The inspector should also determine if there are encroachments to the soil absorption system. Examples of this would include structures located on the soil absorption system or inside required setbacks, evidence of roots invading the system, and any other occurrence that may interfere with the function of or access to the absorption system. The inspector should also note whether roof leaders, drains or other sources of non-sewage hydraulic loading are being fed to the soil absorption area.

The System Inspector is also required to determine if the bottom of the soil absorption system is at or below the high groundwater elevation. Various methods for this determination are explained in the section on Groundwater determination.

Pump inspection:

Certain system designs employ the use of pumps and pump chambers. While there are no specific failure criteria for pumps or pump chambers listed in Title 5, the criteria for inspection listed in 310 CMR 15.302 do require that the System Inspector evaluate the pump system. In addition, some pump chambers act as dosing chambers in lieu of the distribution box, and in these cases would need to be inspected under the minimum inspection requirements.

The pump chambers that a System Inspector is likely to encounter will be simplex (single pump) or duplex (two pumps). Simplex systems will generally be restricted to single or two family residences while duplex systems are required for multi-family and commercial systems.

The level of detail required for inspecting pump chambers under these regulations is fairly minimal for the specific reason that the inspector will be dealing with live electricity and therefore be subject to potential electrical hazards. Unless the System Inspector is thoroughly trained in electrical safety procedures and lockout/tagout protocol and follows these procedures, he or she should take all necessary precautions to minimize exposure to electrical components. Also, pump chambers qualify as confined spaces. As such, there are specific safety guidelines for entry. More information on safety topics is presented in Chapter 6.

The System Inspector should note the condition of the pump chamber itself in terms of structural integrity, watertight integrity, and evidence of corrosion of concrete, other metal components (hatches, ladders, access rungs, etc.) and any of the electrical components. The presence of excess grease and/or solids should be noted. Appurtenances such as slide rails (for pump removal), inlet piping, discharge piping, valves and miscellaneous fittings should be observed to insure that they are intact and functional.

The pump chamber is required to have level controls that regulate pump operation. A typical duplex system will have controls for pumps off, lead pump on, lag pump and alarm on. The circuitry must also be set up so the pumps will alternate in their operation. Simplex systems will have a similar arrangement except that there is no need for a lag pump. The inspector should check the level controls for proper operation. In most instances, the level controls will be mercury float switches that should be activated manually. Level controls and pumps should be installed so they are not subject to hang-ups from any obstructions. The inspector should also note if there is any grease or scum buildup on the floats or switches. If switches are of a type that depend on electrical contact directly with the effluent, excess grease may interfere with their function. The alarm should also be checked to insure that it is in proper working order.

When checking the level switches, the pump function should be observed. The inspector should note if there are any leaks at fittings and fixtures, note if check valves or relief valves operate properly and that the pumps are operating as designed without excessive vibration. Obviously, the switches will be activating the pumps and if they are not, then either the switch or the pump is faulty. Submersible pumps will usually be encountered and if mounted on slide rails (as they usually are), the pump(s) should be raised out of the chamber and inspected for obvious signs of wear and/or failure. It is advisable to consult the operations manual of the pump, if available, before or during the inspection to help determine the type of operation and condition of the pump.

The inspector should also note the available emergency storage capacity above the working level in the pump chamber. Under the regulations, the capacity should be equal to the daily design flow. If emergency power is provided at the site, the inspector should advise the owner/operator that system controls should be operated and tested on a regular schedule.

Single Cesspools:

If the establishment or a section of the establishment being inspected is served by a single cesspool, that cesspool must be exposed and inspected. Inspection of a single cesspool must provide sufficient information to determine if any of the failure criteria are triggered.

The System Inspector can inspect the cesspool using techniques described previously. Essentially, the inspection of the cesspool is comprised of the following:

1. Determine dimensions and materials of construction.

2. Measure liquid level distance to invert and evaluate compared to failure criteria.

3. Determine the distance below the bottom of the cesspool to high groundwater.

4. Note depth of sludge and scum.

5. Require pumping upon completion of initial inspection. Observe infiltration of groundwater, if any.

Overflow Cesspools:

Overflow cesspool systems consist of an initial cesspool that overflows to some type of leaching facility, either pits, fields or trenches. Generally, these systems are found in older facilities and have been installed bit by bit over the years, usually to "repair" failed cesspools. These are hybrid systems and do not fall under the definition of "cesspool" as found in Title 5, nor are they conforming Title 5 systems. As a result, these systems have to be inspected using criteria for both cesspools and conventional systems.

When inspecting an overflow cesspool system, the inspector should recognize that the first cesspool is nominally functioning as a septic tank. This means that this unit is likely to be fitted with inlet and outlet pipes and will not have the requisite free space of six inches or half a day's storage volume that is required for a single cesspool. Accordingly, in order to assess its suitability to function as a septic tank, the first cesspool should be evaluated based on septic tank criteria, except for water tightness. Thus the inspector must check for sludge and scum levels and depths, condition of inlet and outlet tees, and other septic tank criteria. The leaching system(s) or additional cesspool should then be evaluated based on criteria for soil absorption systems.

Because the first cesspool is not watertight, it will leach some effluent and therefore must also be evaluated for setback distances for cesspools as defined in the failure criteria and held to these setbacks for determining failure. In addition, it must also be pumped after the evaluation of its function in order to determine if it is below the maximum groundwater elevation, as is required for single cesspool systems.

In some instances, there may be more than two cesspools in series. Each cesspool that has an inlet and outlet pipe and overflows to another type of soil absorption system is to be evaluated as a septic tank as outlined above. Furthermore, they must be evaluated for cesspool setback criteria and pumped to determine if they are below the maximum groundwater elevation. The terminal leaching facility, whether a pit, trench field or additional cesspool (i.e. no outlet and/or connection to any other leaching facility or cesspool) would be subject to the soil absorption system criteria only.

Groundwater determination:

An adequate separation from groundwater is one of the most important factors governing proper treatment of wastewater in the soil absorption system. As such, determining that the soil absorption system is above the high groundwater elevation is an essential part of the inspection.

In accordance with the regulations, high groundwater elevation should be determined by the least invasive method possible. The following list describes a variety of methods that may be employed to determine high groundwater elevation:

a. if a sewage disposal plan is on record for the site, it should include groundwater elevations from the original deep observation hole. If not available, determine if such information is available from adjacent lots. Make appropriate adjustments to determine high groundwater elevation.

b. regional planning agencies may have records indicating high groundwater elevation in the particular city or town. If so, it can be determined if the bottom of the leaching facility is above the high groundwater elevation.

c. USDA Soil Conservation Service soil surveys and maps may provide indications of high groundwater.

d. observation of infiltration into the septic tank or distribution box. If infiltration is evident, the surrounding soil shall be examined to determine groundwater elevation.

e. pumping a cesspool to monitor groundwater rise, as required by 310 CMR 15.302(3)(a)(2). This approach may also be appropriate for other leaching facilities, particularly pit, gallery or chamber systems that have access and inspection ports.

f. use a hand auger if groundwater is suspected to be near the surface. Various standard measuring techniques can be used to determine groundwater depth. Use appropriate adjustments to estimate high groundwater elevation.

g. note the position of the system if in proximity to a water body or wetland.

h. note if there is a cellar sump pump in the building being served or if there are foundation drains around the building.

Methods (i) through (l) below constitute more invasive means of determining high groundwater elevation. It is not suggested that these methods are required in all cases; however, in instances where methods (a) through (h) above have failed to provide adequate information for determining high groundwater elevation, it may be necessary to employ these methods as described below.

i. small diameter wellpoints can be driven to monitor groundwater elevation. Use appropriate adjustments to determine high groundwater elevation. This method may be suited to soils that are easier to penetrate with smaller equipment and may limit applications in tighter soils. However, a drilling contractor should be consulted about the application of this method in any given soil condition.

j. after observing effluent water levels, pump the leaching facility and monitor to see if groundwater rises to the bottom (may be more applicable to pits, chambers and galleries than trenches and fields). In general, if the groundwater can be observed after pumping, regardless of the type of system, this method should yield reliable results. This approach should be taken with caution. If done during the dry season, the results do not guarantee that subsequent groundwater level rise will not inundate the leaching system. Best professional judgment must be used in order to determine at what point backflow into the system is due to groundwater infiltration or other factors. Also, in some soils, groundwater may take some time to stabilize. In these instances proper precautions must be taken to insure that the open area around the leaching facility is properly secured to prevent injury.

The system owner may choose to have the high groundwater elevation determined by the methods described in k. and l. below to confirm or disprove the results obtained by other methods, or in place of the minimum requirements.

k. drive an observation well with a well drilling rig or powered auger, observe the groundwater elevation and make appropriate adjustments to determine high groundwater elevation. The maximum depth of the observation well should be twelve feet below grade at the lowest natural elevation on the site or six feet below the bottom of the leaching facility.

l. dig a deep observation hole (generally the last resort) and use appropriate adjustments to determine maximum high groundwater elevation. The maximum depth of the hole should be twelve feet below grade at the lowest natural elevation on the site or six feet below the bottom of the leaching facility.

If groundwater levels are observed through the more intrusive methods described above, appropriate adjustments may have to be made to determine high groundwater elevations since it is not guaranteed that the inspection will be conducted when the groundwater is at its highest elevation.

Soils can be used to determine the presence and approximate elevation of a seasonal high water table, even during dry periods when the water table may be much lower. When a water table fluctuates within a soil it causes alternating saturated (reduced) and unsaturated (oxidized) conditions. The chemical reactions caused by these different conditions result in color changes within the soil profile.

The coloration caused by a fluctuating water table within a soil is referred to as mottling. Soil mottles are variegated or irregular spots of orange, yellow and gray colors within the soil profile. The highest point that gray color mottles are observed in the soil is a clue for estimating the average seasonal high water table level. It is important to keep in mind that the highest point of distinct mottle occurrence relates to the estimated average seasonal high water table. For any given year, the actual high water table may be higher than or lower than the average.

The amount of gray colors within a mottled area indicates the duration of saturation. The more gray present, the longer the soil is saturated. A gleyed soil condition is one that results from prolonged periods of wetness, and the soil material is gray throughout with possibly only a few orange or yellow mottles. Increasing amounts of orange and/or yellow mottles indicate areas of soil that are saturated just during the very wet periods of the year.

"Rust line" is a term often used by health agents to describe a dark red layer or band in the soil that is often interpreted as being the maximum height of the water table. Bright red and yellow streaks can form within the soil through two contrasting processes that may or may not be the result of a high water table.

Those not associated with a water table may develop when percolating water is momentarily interrupted as it passes through different soil strata. This brief pause may cause dissolved iron within the water to precipitate out and over many years develop a bright red or yellow streak. This soil feature is common within some stratified sand and gravel deposits, and can often be observed on the sides of gravel pits high above any water table.

Only in a few unique situations do soils develop a rust line resulting from a fluctuating water table and they are the exception rather than the general rule. Rust lines associated with a water table are the result of a fluctuating water table and dissolved iron in the groundwater. As the water table fluctuates, iron precipitates out forming a coating on the surface of soil particles and with time develops a bright red and yellow line in the soil. For a rust line to be interpreted as an indicator of the maximum high water table elevation it should meet some or all of the following criteria: the rust line should appear as a nearly continuous band on all sides of the deep observation hole; it should be on a nearly level plane within the hole; soil mottling should be observed below the rust line; and in some situations dark nodules of hardened or cemented soil material are present within the rust line. In situations where gray color mottles occur above a rust line, the height of the gray mottles should be interpreted as the height of the average seasonal high water table and not the underlying rust line.

A soil condition that exists in some wet areas is locally referred to as bog iron. Bog iron is a cemented layer within the subsoil that is dark red and in some instances almost black. This layer is difficult to penetrate and is generally only a few inches thick. Bog iron is formed by a fluctuating water table and indicates a wet soil. Gray mottles are not present within the bog iron layer but are generally observed either above or below it.

Another method for estimating high groundwater elevation was developed by the U.S. Geological Survey and is explained in detail in Probable High Groundwater Levels in Massachusetts (USGS Water Resources Investigations, Open File Report 80-1205) commonly referred to as the Frimpter method. By using the historical record of a network of groundwater observation wells, this method correlates observed water elevations at the site and at a reference well in proximity to the site and in a similar geologic setting to a probable groundwater rise. This method involves the use of a specific mathematical equation and an understanding of geological formations.

Both these methods require specialized training that is beyond the scope of this manual. Soil scientists or Approved Soil Evaluators can be of assistance in the use and application of these methods and should be consulted.

Setbacks:

The failure criteria listed in 310 CMR 15.303 include certain setback requirements for cesspools, privies and soil absorption systems. The System Inspector must determine compliance with these setbacks as part of the inspection. In some instances, particularly with respect to setbacks to wetland resource areas, the inspector must either be competent in wetlands delineations or rely on the services of someone who is.

For determinations relative to setbacks from surface water supplies, tributaries from water supplies and Zone I's of public water supply wells, and private water supply wells, the inspector should consult with the local water department, board of health, system owner, or the Division of Water Supply in the Department's regional office. Maps indicating locations of public drinking water supply resources should be on file with the board of health.

In the case of tributaries to those public water supplies (Ware, Quabbin and Wachusett) to which the provisions of 350 CMR 11.00 (MDC Watershed Protection regulations) apply, such tributaries shall be identified solely by reference to the maps identified in 350 CMR 11.07(3) (most recent edition of Massachusetts GIS maps unless MDC submits more detailed maps to the legislature in accordance with 350 CMR 11.07(3)). To aid in identifying the location of all other tributaries to a public water supply, reference may be made to a Department publication titled "Designated Outstanding Resource Waters of Massachusetts 1990", dated July, 1993, as amended. This publication is intended solely as an informational aid. In the event of conflicting information, the surface water quality standards found in 314 CMR 4.00 shall prevail.

If a cesspool, privy or soil absorption system is less than 100' but greater than 50' from a private well, the system must be failed unless acceptable water quality data from the well, as referenced in 310 CMR 15.303 (l) and (m) is provided. The analyses required are for coliform bacteria, volatile organic compounds (VOCs) and ammonia nitrogen and nitrate nitrogen. Coliform bacteria, ammonia and nitrate shall be analyzed by a Massachusetts certified laboratory according to Standard Methods for the Examination of Water and Wastewater. VOCs shall be analyzed by a Massachusetts certified laboratory according to the EPA 500 series. In all instances, proper sampling procedures must be followed.

Difficulty in locating components:

If the inspector has difficulty locating components of the disposal system, the following steps should be followed:

1. Pursuant to 310 CMR 15.302 all components prior to the leaching facility must be located.

2. If the high groundwater elevation is 12 feet below or lower than the lowest elevation on the lot, and there is no evidence of backup in the system, the leaching facility most likely is not below the high groundwater elevation. This condition, however, should not relieve the inspector from exercising due diligence in locating the leaching facility and inspecting its condition.

Keep in mind that the approving authority may determine that reasons for entering information as "Not Determined" on the inspection form are inadequate and may require that the inspector provide that information. When in doubt, try to be as complete as possible in conducting the inspection.